

J. W. Bryant
With the author's
kind regards
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ON

COLLES' FRACTURE:

AND FRACTURES OF THE SAME PART OF THE
LOWER END OF THE RADIUS.

BY

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COLLES' FRACTURE AND THE FRACTURES OF THE SAME PART OF THE LOWER END OF THE RADIUS.

THE examination of a large collection of specimens of fractures of the lower end of the radius affords me the opportunity of discussing these injuries, with a fair prospect of being able to answer some at least of the undecided questions relating to them. I propose to deal only with fractures of the cancellated extremity of the bone; Colles' fracture and the lesions involving the same part, omitting even the fracture just above this region, usually discussed in connection with it.

I submit, as the basis of this study, sixty specimens of these injuries from the collection under my charge in Trinity College, and, by the kindness of the Council of the Royal College of Surgeons, I am able to show two most important recent specimens. Every surgeon admits, I believe, the value of the researches of Professor R. W. Smith and of Voillemier in the pathology of these injuries, which have served to correct and complete the descriptions of Colles and of Dupuytren.

Since their views have been published, we find authorities ranging themselves on opposite sides, according as they adopt the non-impaction theory of Smith, or the opposing doctrine of Voillemier, that all these injuries are fractures by penetration. Of late, the number of recent dissections have forced most writers to admit the occurrence of each form. We have ample proof that the simple transverse fracture without impaction, the impacted, and the fracture *par écrasement* with a shattered lower fragment, are all possibilities. Intimately connected with the theory of impaction is the explanation of the variability of the symptom so much relied on in the diagnosis: crepitus. Yet anyone who will take the trouble to investigate the statements contained in the accounts of recent cases which have been submitted to dissection, may find that this symptom has been absent in each form of the injury. We cannot, therefore, rely on its absence as the proof of the existence of impaction in any given case, nor are we for the same reason to abstain from attempting reduction of the deformity for fear of undoing the impaction, or again rely on it as a safeguard against displacement, and so adopt a lax treatment. I will notice here that, valuable as recent dissections are in guiding our examination of united specimens, too high an importance has been attached to them by some. Certainly I cannot agree with Mr. Callender, that the dissection of three cases where the fracture was caused by exceptionally great violence are sufficient "to remove all doubt on this subject". I cannot agree with him even when he makes the following remark: "There can be no question but that impaction is the cause of the displacement." This surely is to mistake

the effect for the cause. The following passage from Voillemier shows that, however fully impressed he was in favour of the theory of impaction, he avoided the error of committing himself to its absolute adoption. "Mais il faut être prévenu que dans certains cas de pénétration peu marquée, de fractures par arrachement, il peut n'y avoir aucun changement dans les axes du membre, pas de raccourcissement, pas de mobilité des fragments, pas de crépitation et seulement de la douleur, du gonflement autour du poignet, enfin tous les symptômes d'une entorse, et ces cas ne sont pas très-rare."

Here the author admits a group of injuries sufficiently common, in which impaction is absent or inappreciable; in which, too, crepitus and deformity are absent. If such cases be overlooked, as they too commonly are, the most extreme deformity establishes itself in a short time, as I have more than once observed. These facts are certainly inconsistent with the theory that deformity, the result of displacement, is solely due to impaction, and that muscular action takes no part in its production.

In opposing Voillemier's views, Smith falls into the opposite error, in almost absolutely denying the occurrence of impaction. He says, "I am inclined to believe that the doctrine of fracture with penetration is untenable". He says, indeed, in another passage, "Until, therefore, the result of the examination of recent specimens can be adduced in support of the theory, I shall be inclined to believe that impaction is only apparent". I have the good fortune to be able to exhibit here the specimen, the recent dissection of which seems to have so strongly influenced his opinion, a specimen familiar to the readers of his book, which the College of Surgeons have kindly exhibited here. This specimen, with many others since recorded, obtained by *post mortem* examination and by experiment, establish the existence of the simple fracture, no matter how many cases of the impacted variety may be found. The circumstance which seems to have confirmed him in his opinion is expressed in the following passage in that part of his paper in which he discusses the opinion of Voillemier on the value of the constancy of the third line of compact tissue seen imbedded in the cancelli of the lower fragment of united specimens. "If it indicated the forcible impaction of the upper into the lower fragment, we should expect to find the latter split into two or more pieces, but this form of fracture of the lower end of the radius is comparatively rare."

I can prove from the collection before me, a collection made without any reference to this question, and certainly representative of the general features of the injury, that the opinion that comminuted fractures of the lower fragment are comparatively rare, is incorrect.

I think, too, that I can show proof that Voillemier's opinion as to the relative frequency of the forms of impaction is not correct. He describes four possible varieties of impaction: 1. The penetration of both walls of the upper fragment into the tissue of the lower without its being burst asunder; 2. The same mode of penetration, with crushing of the lower fragment.—Dupuytren's fracture *par écrasement*; 3. The bending or hinging, so to speak, of the anterior walls, with impaction of the upper into the lower fragment posteriorly; 4. The reciprocal penetration of the fragments, the upper into the lower behind, and the lower into the upper in front. Of these possible forms of impaction, he believes the third to be the most common, founding his opinion apparently on the observation "that the impacted line is never double"; an observation in which Smith agrees.

I am able to show, among the specimens before the meeting, that exceptions occur to this rule; further, that comminution is more common than Smith has estimated it to be, and that the paths of the fractures which occur in the lower fragment present a remarkable constancy in position. If I rightly interpret these appearances, the conclusion must be arrived at that, in comminuted fractures, reciprocal impaction is the most common form of the accident.

The number of specimens which I submit is in all sixty-two. Of these, fifty-four are true Colles' fractures, transverse in the general direction of the fracture, the lower fragment displaced backwards, with more or less distortion in the direction of the inferior articular surface, the most constant element of which is dependent on the elevation of the styloid process. Four specimens are examples of the rare injury in which the lower fragment is displaced forwards; three are epiphysary separations; and in one a fracture has occurred, detaching the styloid process of the radius, with a small portion of the articular surface adjoining it.

In estimating the frequency of comminution of the lower fragment, I have included under this head only such specimens as exhibit distinct evidence of fracture having passed completely through the carpal articular surface; many specimens present evidences of splintering of the non-articular surface of the lower fragment, and some of the upper also, but I think such should be excluded in the present discussion. Applying this test, we find, of the specimens before us, thirty-one are simple, twenty-three comminuted, a fact that is inconsistent with Smith's statement "that this form of fracture is comparatively rare".

Before stating the remaining facts exhibited by these comminuted specimens, I may delay a moment to consider the mechanism of the injury. Arguing *à priori*, as the path of Colles' fracture is generally transverse with regard to the long axis of the radius, and the displacement of the hand tends constantly in the direction of abduction, we should expect that the upper fragment acting as a wedge, if this be the cause of the comminution, should split the lower first and most constantly at that border of the lower fragment next the ulna, against which the force is directed, and where the lower fragment is thinnest. This is exactly what the specimens before us prove to be the case. Among those of the simple fractures which border on the comminuted in their characters, we find a crack first appearing on the ulnar facette, reaching just to the carpal surface, placed at the centre of the curve of the facette.

In ten of the twenty-three comminuted, a fissure, starting from the same point in the ulnar facette, runs into the carpal articular cartilage along its posterior edge, breaking out into the dorsal surface of the bone, either, in the least extensive injuries, at the outer side of the common extensor groove, or in others running along as far as the groove for the radial extensors, and, in a few breaking out at each of these points. The frequency of this position of fracture has been already noticed by Packard.

Its frequency appears to have led Rhea Barton into the error that there was a form of fracture limited to this region of the bone, requiring to be distinguished in practice from Colles' fracture. His idea of the mechanism of the injury is quite the reverse of what we see in action here; for he supposed that pressure of the carpus in over-extension detached the fragment. In the eleventh specimen of the series, a branch is traced passing off from the first fissure towards the anterior depression in the scaphoid facette; this fissure is seen in the bone, but as we often

54 rca

23 comm

231 fr

find in such, has left the cartilage intact. In the twelfth specimen, the fissure starting as before, passes along the route indicated in the preceding, but without any posterior branch. In the next five specimens, the primary fissure exists with its anterior and posterior branches. In three of the four remaining specimens, the features of the comminutions are the same, but chronic rheumatic arthritis has masked their exact details, so that it is difficult to follow them. In one specimen only are the features of the lines of the fracture entirely different; in it an oblique line seems to have detached the styloid process, passing from in front backwards and inwards across the scaphoid facette.

There appears then sufficient ground for the assertion that the mode of comminution is constant, and that it results from the impaction of the upper into the lower fragment, taking effect first and chiefly on the side of the fragment next the ulna.

A further examination of these specimens shows that, where the fractures remain sufficiently distinct in outline to trace their details exactly, the impaction of the fragments is reciprocal; that while the posterior surface of the upper pierces the lower, the anterior of the lower penetrates the upper, it may even lead to its splintering. This conclusion is at variance with the opinion of Voillemier; but I believe the explanation of the discrepancy between us is, that hitherto the examination of comminuted specimens has not been made with sufficient care. I believe that in many simple fractures no impaction whatever occurs, and again that in many injuries, Voillemier's third variety, the bending of the anterior wall with posterior impaction, occurs. I cannot resist the conclusion to which this collection leads, that in comminuted fractures, which occur in proportion to simple injuries almost in the ratio 2:3, the characters are constant and the result of reciprocal impaction of the fragments.

The limit of time forces me to deal very briefly with the complications of Colles' fracture presented by the series before the meeting, viz.:—

1. Necrosis of the lower fragment in the simple fracture.
2. Fracture of the shaft of the radius higher up.
3. Fracture of both bones of the fore arm, also higher up.
4. Fracture of the styloid process of the ulna.

1. The fracture in which necrosis occurred is entirely exceptional; the injury was in all respects of the ordinary type, without excessive deformity or any wound. On the patient, of 35 years of age, resuming work at the close of the treatment, which lasted about five weeks, the limb suddenly swelled and abscesses formed, leading finally to amputation.

2. The fractures of the radius alone, higher up, are seen in two instances where the usual distortions of such injuries are absent, or at least very slightly marked; phenomena which I have myself noticed in this complication occurring in the living, the Colles' fracture, so to speak, taking precedence in establishing its deformity, while the fracture of the shaft was discoverable chiefly by its pain and local crepitus.

3. In another specimen, where both bones are broken, the radius very high up, the features of the fracture suggest its having occurred independently of the Colles' fracture.

4. In the instances of fracture of the ulnar styloid, the characters of this complication are well seen. These specimens were more numerous than the collection shows, for I have, in dissecting some now not characteristic specimens, noticed this lesion, but the little fragment of

bone is lost in maceration or after the specimens dry. I am confident that in all the fracture occurs as in the examples preserved—a fracture of the styloid caused by traction on the lateral ligament of the wrist, free of direct relation to the attachment of the saciform ligament; that this fracture unites in the majority by ligament only with very insignificant deformity. I notice these points merely to give expression to the opinion I hold as to this complication, that it is of practical importance only as explaining the occasionally severe pain observed at the position of the ulnar styloid, that it is quite unimportant in regard to the deformity or other leading phenomena of Colles' fracture.

Of the rare injury, fracture of lower end of the radius, with displacement of the lower fragment forwards, the collection contains four specimens; of these, two agree with the description given by Professor Gordon; two, on the other hand, agree with the figure published by Voillemier. The relative number of these specimens proves the inapplicability of the name applied by Professor Gordon to this fracture, "articular", for we see here the fractures as remote from the joint as in ordinary Colles' fractures.

The next group of our series includes two specimens of epiphysary separation, with which I have the good fortune to be able to exhibit also the casts of the limbs of the patient. The third specimen I place in this group with less confidence, but I will presently state my reason.

The two recent specimens are taken from the limbs of a boy who died a few days after a fall from a height on his head, the head injury proving fatal.

The casts in these cases contrast, as many similar casts in our collection do, with the representations of the deformity in Colles' fracture, in the transverse features of their dorsal and palmar projections, and in the folding of the skin in the palmar depression, and again in the absence of abduction of the hand. If we add to these the easy reduction of the fracture, and the facility of obtaining crepitus, and, still more remarkable, the facility of maintaining the reduced fracture in place, phenomena all long since pointed out by Smith, which I may state I have frequently observed and verified myself, there are, I think, ample grounds for questioning the recent statement of Professor Macleod, that "there are no distinctive signs by which a separation of it (the radial epiphysis) can be differentiated from an ordinary Colles' fracture." The united fracture I place in this group is remarkable when compared with all or any specimen of the collection of Colles' fractures, for, while there has been clearly a fracture at the usual seat, it alone presents the feature of a styloid process bearing its normal relation to the ulnar styloid, and a carpal surface almost without maldirection. There are faint traces of an ulnar fracture just above its epiphysis, as often occurs with the radial detachment. The recent specimens, I should note, present fractures confined to the radius. On one side, the lower fragment is comminuted; on the opposite, simple; a little scale of bone is detached from the diaphysis on the side which shows the comminution.

The remaining specimen is interesting for its rarity; the radial styloid has been detached by a fracture passing sheer across through its base into the scaphoid facette; the fracture in its union suggests that the limb was held during treatment in adduction, for the normal obliquity of the carpal surface is increased in this direction.
